



SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

ENGINEERED CERAMIC SEAL PRODUCTS

FOR ROTATING EQUIPMENT



SAINT-GOBAIN 2021



1 in 4 products
did not exist 5 years ago



166.000+
employees



sales of
€ 44.2 billion



represented in
75
countries



-23%
carbon emissions
reduction (vs. 2017 on scope 1+2)



8
main R&D centres

OUR MISSION

Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the well-being of each of us and the future of all.

OUR PURPOSE

MAKING THE WORLD A BETTER HOME.



WE ARE COMMITTED TO BEING CARBON FREE BY 2050.



**SAFE ENERGY,
REDUCE CO₂ EMISSION**

SAINT-GOBAIN

PERFORMANCE CERAMICS & REFRACTORIES

Saint-Gobain Performance Ceramics & Refractories is a global leader in supporting composite armor systems, offering unparalleled design flexibility with the most innovative and consistent ceramics on the market. Our high-performance, lightweight ceramic materials are designed for the utmost performance in modern ballistic protection.

Benefit from these advantages:

- Custom engineering to customer specifications
- Co-development options
- Consistent high-quality manufacturing
- Extensive worldwide capacity
- Rapid prototyping
- Global R&D resources

PIONEERING CERAMIC SOLUTIONS FOR EXTREME INDUSTRIAL APPLICATIONS AND A GREENER WORLD.



MECHANICAL SEAL FACE SOLUTION

Saint-Gobain Performance Ceramics & Refractories' utilize materials expertise, innovative designs, creative engineering and precision manufacturing processes to deliver reliable solutions for rotating equipment to global OEM customers and machine shops.

APPLICATIONS

Saint Gobain Performance Ceramics & Refractories business offers a family of Hexoloy® sintered alpha silicon carbide and Noralide® silicon nitride materials for high performance seal face application in:

- Automotive water pumps
- Chemical processing pumps
- Gas seals for compressors
- Nuclear reactor coolant pumps
- Industrial pumps in Oil & Gas refining, mining, pulp & paper processing, power plants, water treatment plants, refrigeration

WHY HEXOLOY® SILICON CARBIDE?

The outstanding properties of Hexoloy® Silicon Carbide (SiC) allow unmatched performance in corrosive environments, abrasive fluids, high temperature and pressures, or high speeds.

FEATURES

-  Exceptional wear resistance, hardness & low friction
-  Excellent corrosion resistance
-  Excellent mechanical strength
-  High thermal shock resistance

MULTIPLE
SHAPES
AVAILABLE

UNGROUND SEAL TUBES

Hexoloy® SA • Hexoloy® SG • Hexoloy® SP

Sintered silicon carbide seal tubes are available in a wide range of OD and ID combinations. OD up to 16 inches (400 mm).

Typical length of the seal tube is 12", through 6" and 4" tubes are also available. Seal tubes are unground and sold with "as-fired" tolerances.



BENEFITS

-  Best option for quick turn around
-  Lead times, typically < 4 weeks
-  Sold from a price list*



Hexoloy® SA is used in most applications
Hexoloy® SP retains lubrication

UNGROUND SEAL BLANKS

CUSTOM
ENGINEERED

Hexoloy® SA • Hexoloy® SP

Low volume machined blanks

- Made to customer specified diameters and thickness, with a maximum diameter of 16 inches
- Tolerances can be + / - or + + / - -

High Volume Pressed Blanks

- Made to customer specified diameters up to 5"
- A minimum length to wall thickness ratio of 4 to 1 must be maintained
- OD, ID Tolerances can be + / - or + + / - -



Minimum order quantity (MOQ) of 1000 pcs
Tooling required

* Hexoloy® SA only

100%
INSPECTION

SEAL FACES

Hexoloy® SA • Hexoloy® Enhanced SA • Hexoloy® SG • Hexoloy® SP • Noralide®

Ground seal faces are available in various Hexoloy® sintered silicon carbide grades and Noralide® hot pressed silicon nitride materials.

Both of these materials are fine-grained and produced to near theoretical density, ensuring excellent wear resistance required for seal face products.

Both materials possess outstanding resistance to corrosion from chemicals with a wide range of pH values. Seal faces are produced to custom drawings with high quality surface finishes.



FEATURES



Exceptional hardness



Chemically inert to a broad range of chemicals



Ground and lapped

Made to customer specified drawing

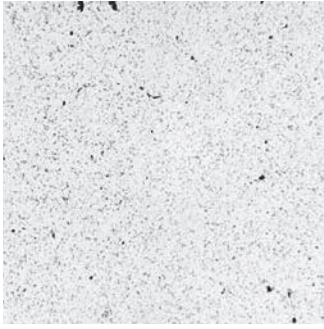
Strict quality control and inspection



SCAN TO CONNECT
and discover more about our
Specialty Ceramics solutions.

CUSTOM-MADE
MATERIALS & SOLUTIONS





Photomicrograph of Hexoloy® SA SiC (200x)

HEXOLOY® SA SiC

Hexoloy® SA SiC is a pressureless sintered form of alpha silicon carbide, with a density greater than 98% theoretical. It has a very fine grain structure (<10 micron) for excellent wear resistance and contains no free silicon, which makes it highly chemically resistant in both oxidizing and reducing environments.

FEATURES & BENEFITS

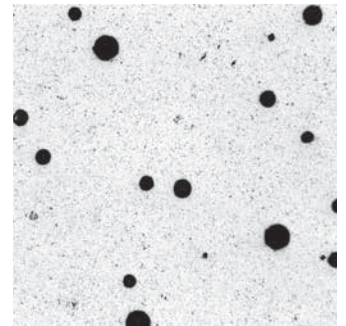
- Excellent wear resistance and hardness
- High elastic modulus: stiff
- Excellent corrosion resistance: Outperforms tungsten carbide, aluminum oxide and reaction bonded SiC in all chemical environments.

HEXOLOY® SP SiC

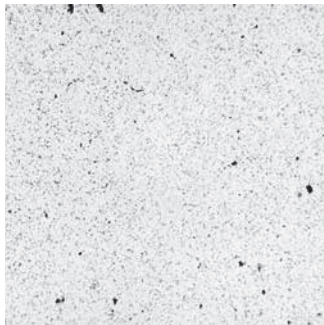
Hexoloy® SP SiC contains engineered spherical pores (~50 µm, 4 - 6% by volume) for optimum tribological performance. It is used in sliding contact applications such as pump seal faces and product lubricated bearings.

FEATURES & BENEFITS

- Excellent hard face vs. hard face performance
- Excellent for dry running conditions in pumps



Photomicrograph of Hexoloy® SP SiC (200x)



Photomicrograph of Hexoloy® SG SiC (200x)

HEXOLOY® SG SiC

Hexoloy® SG silicon carbide is a unique electrically conductive version of sintered silicon carbide.

FEATURES & BENEFITS

- Contains graphitic carbon (5%), no free silicon
- Excellent thermal conductivity
- Higher electrical conductivity than Hexoloy® SA & SP
- Machinable by EDM

NORALIDE® SILICON NITRIDE

Noralide Si₃N₄ is an ideal material for seal face applications where maximum fracture toughness and flexural strength are required.

FEATURES & BENEFITS

- Hot pressed product
- Twice as strong as Hexoloy® SA
- Excellent corrosion resistance



Photomicrograph of Noralide® SiC (100x)

PROPERTIES OVERVIEW

Saint-Gobain Performance Ceramics & Refractories' application engineers are available to assist you with your technical project in designing cost effective high performing products that will meet your need now and in the future.

Physical Properties	UNITS	HEXOLOLY® SA	HEXOLOLY® SG	HEXOLOLY® SP	NORALIDE®
Composition*	-	SiC	SiC	SiC	Si ₃ N ₄
Density	g/cm ³	3.10	3.00	3.04	3.18
Grain Size	µm	4-10	-	4-10	<2
Hardness (Knoop)**	kg/mm ²	2,800	2,800	2,800	N/A
Flexural Strength 4pt @ RT	MPa x 10 ³ lb/in ²	380 55	311 -	240 35	800 -
Compressive Strength @ RT	MPa x 10 ³ lb/in ²	3900 560	-	-	3,500 -
Modulus of Elasticity @ RT	GPa x 10 ⁶ lb/in ²	410 59	-	400 58	320 -
Weibull Modulus (2 parameter)	-	8	18	19	-
Fracture Toughness @ RT Double Torsion & SENB	MPa x m ^{1/2} 10 ³ lb /in ² x in ^{1/2}	4.60 4.20	3.90 4.60	4.30 3.90	4.10*** -
Coefficient of Thermal Expansion RT to 700°C	x 10 ⁻⁶ mm/mmK x 10 ⁻⁶ in/in°F	4.02 2.20	-	4.20 2.30	2.9 -
Max. Service Temp (air)	°C °F	1,900 3,450	-	1,900 3,450	-
Mean Specific Heat @ RT	J/gmK	0.67	0.65	0.59	-
Thermal Conductivity @ RT @ 200°C @ 400°C	W/mK	125.6 102.6 77.5	118 92 70	110 - -	-
Permeability RT to 1000°C	-	Impervious to gases over 31 MPa			
Electrical Resistivity @ RT**** @ 1000°C	ohm-cm	10 ² -10 ⁸ 0.01-0.2	1.0-10.0	-	>10 ¹²

** Composition code: SiC = silicon carbide; Si₃N₄ = silicon nitride

** Knoop 100-gm load

*** Indentation

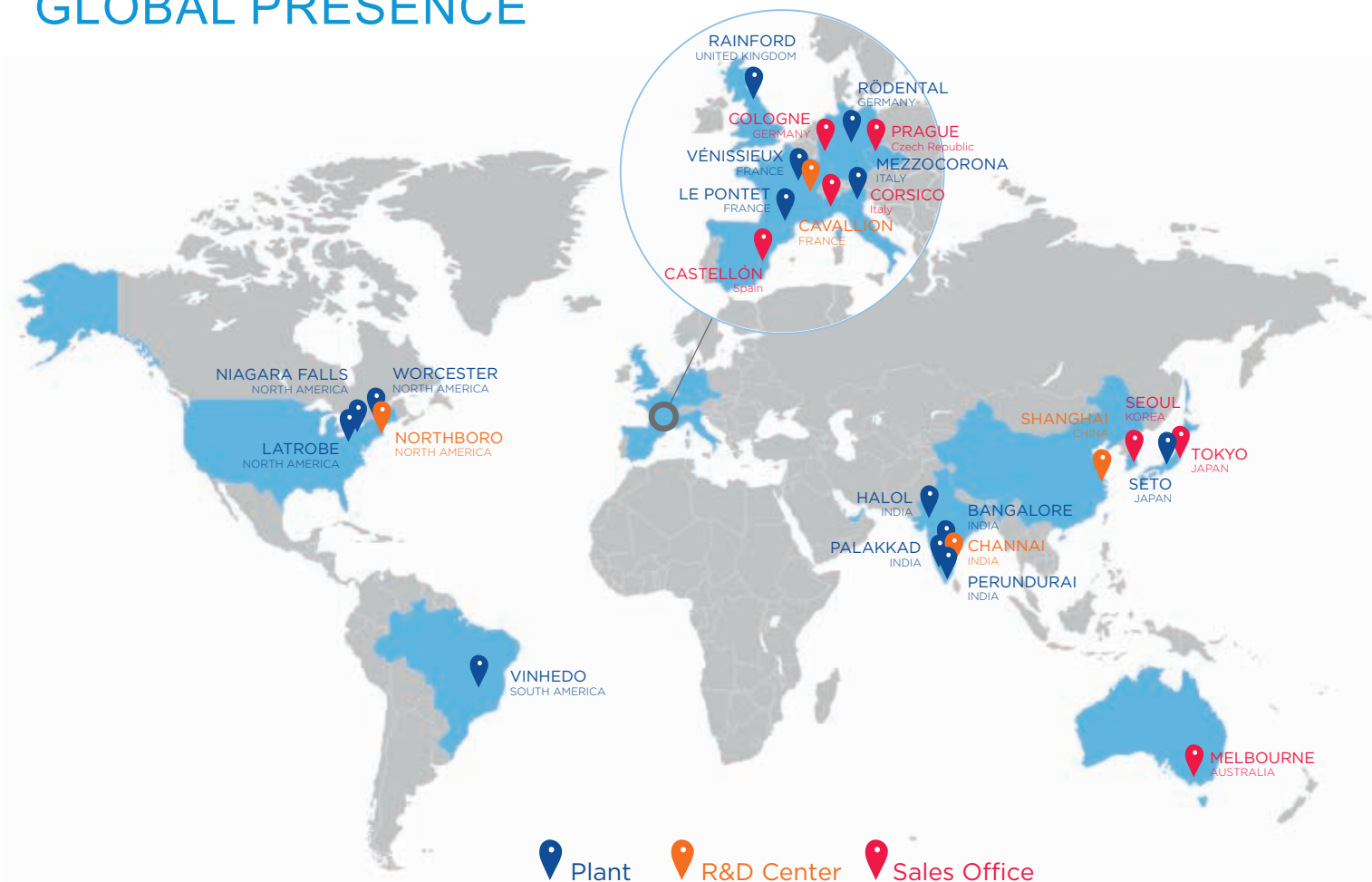
**** Dopants in Hexoloy® cause fluctuation in resistivity.



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and discover more about
our materials.



GLOBAL PRESENCE



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PERFORMANCE CERAMICS & REFRACTORIES

